

[0074] Below is another table listing some of the so-called third generation mobile communication systems to which the present invention may be applied. The table shows the most important radio interface related characteristics of the system.

CELLULAR SYSTEM	WCDMA	
RX FREQ. (MHz)	2110-2170	1900-1920
TX FREQ. (MHz)	1920-1980	1900-1920
MULTIPLE ACCESS METHOD	CDMA	TDMA
DUPLEX METHOD	FDD	TDD
CHANNEL SPACING	5 MHz	5 MHz
MODULATION	QPSK	
CHANNEL BIT RATE	144 kb/s in rural outdoor, 500 kb/s in urban outdoor and up to 2 Mb/s in indoor	

1. A direct-conversion transceiver capable of operating with different radio interfaces including a first radio interface conforming to a code division multiple access (CDMA) system and a second radio interface conforming to a time division multiple access (TDMA) system, comprising:

- a first controllable bandpass filter configured to filter a received signal according to a control signal that selects one of a plurality of passbands corresponding to one of the different radio interfaces, wherein the first controllable bandpass filter has a signal path common to both the first radio interface and the second radio interface;
- a low-noise amplifier configured to amplify the filtered received signal according to a control signal that controls an amount of gain, wherein the low-noise amplifier has a signal path common to both the first radio interface and the second radio interface;
- a first programmable synthesizer configured to generate a first mixing signal according to a control signal corresponding to the selected one radio interface, wherein the first programmable synthesizer has a signal path common to both the first radio interface and the second radio interface;
- a first frequency divider coupled to the first programmable synthesizer and configured to divide a frequency of the first mixing signal by two to provide a first divided frequency signal according to a control signal corresponding to the selected one radio interface;
- a first mixer coupled to the low-noise amplifier and configured to mix the amplified and filtered received signal with the first divided mixing signal to produce a first baseband quadrature signal, wherein the first mixer has a signal path common to both the first radio interface and the second radio interface and wherein the first mixer produces the first baseband quadrature signal on the basis of two 90-degree phase-shifted components produced from the first frequency divider and is operable to process either a TDMA signal or a CDMA signal;
- a first low-pass filter coupled to the first mixer and configured to low-pass filter the first baseband quadrature signal according to a control signal corresponding to the selected one radio interface, wherein the first low-pass filter has a signal path common to both the first radio interface and the second radio interface and is operable to process either a TDMA signal or a CDMA signal;
- a first gain-controlled amplifier coupled to the first low-pass filter and configured to provide gain-controlled amplification of the first low-pass filtered baseband quadrature signal, wherein the first gain-controlled

amplifier has a signal path common to both the first radio interface and the second radio interface and is operable to process either a TDMA signal or a CDMA signal;

- an analog-to-digital converter coupled to the first gain-controlled amplifier and configured to convert to digital form an output of the first gain-controlled amplifier;
- a digital signal processor configured to receive digital output from the analog-to-digital converter and to further process said digital output;
- a digital-to-analog converter coupled to the digital signal processor and configured to receive a second baseband quadrature signal therefrom and to provide analog output signals;
- a second low-pass filter coupled to the digital-to-analog converter and configured to low-pass filter the analog output signals from the digital-to-analog converter according to a control signal corresponding to the selected one radio interface, wherein the second low-pass filter has a signal path common to both the first radio interface and the second radio interface and is operable to process either a TDMA signal or a CDMA signal;
- a second programmable synthesizer configured to generate a second mixing signal according to a control signal corresponding to the selected one radio interface, wherein the second programmable synthesizer has a signal path common to both the first radio interface and the second radio interface;
- a second frequency divider coupled to the second programmable synthesizer and configured to divide a frequency of the second mixing signal by two to provide a second divided frequency signal according to a control signal corresponding to the selected one radio interface;
- a second mixer coupled to the second low-pass filter and configured to mix signals from the second low-pass filter and the second frequency divider to produce a carrier-frequency transmission signal, wherein the second mixer has a signal path common to both the first radio interface and the second radio interface and wherein the second mixer produces the carrier-frequency transmission signal on the basis of two 90-degree phase-shifted components produced from the second frequency divider and is operable to process either a TDMA signal or a CDMA signal;
- a second gain-controlled amplifier coupled to the second mixer and configured to control gain according to a control signal corresponding to the selected one radio interface, wherein the second gain-controlled amplifier has a signal path common to both the first radio interface and the second radio interface and is operable to process either a TDMA signal or a CDMA signal;
- a power amplifier coupled to the second gain-controlled amplifier and configured to produce an amplified output using a frequency band determined on the basis of a control signal corresponding to the selected one radio interface, wherein the power amplifier has a signal path common to both the first radio interface and the second radio interface;
- a second controllable bandpass filter configured to filter an output of the power amplifier according to a control signal that selects one of a plurality of passbands corresponding to the selected one radio interface, wherein the